



THE CONSTRUCTION OF A HIGH-QUALITY GRADUATE TEXTBOOK ON “MODERN SEPARATION TECHNOLOGY” IN THE CONTEXT OF THE NEW ERA

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ABSTRACT

In order to advance graduate education reform in the new era, comprehensively improve the quality of graduate education, effectively serve the national economic and social development needs, and highlight discipline characteristics and development frontiers, the textbook on “Modern Separation Technology” has been developed with an updated knowledge system tailored to the course’s teaching objectives. It integrates discipline frontiers, the latest research achievements, and practical experiences. Adopting a compilation mode that combines cases with teaching content, the textbook aims to further strengthen the integration of science, education, and industry. The new edition of the textbook is expected to represent a high level among similar textbooks in this discipline domestically, reflect the latest outcomes of graduate teaching reform, possess good versatility, and be suitable for graduate students’ learning characteristics.

KEYWORDS: The New Era, Modern Separation Technology, Graduate, High-Quality, Textbook

1. INTRODUCTION

Separation processes occupy a crucial position in chemical production. “Modern Separation Technology” is one of the most important core courses for graduate students majoring in chemical engineering, with the primary mission of studying the theories and techniques of chemical extraction, separation, and purification. It covers interdisciplinary areas where chemistry intersects with other disciplines. Through this course, graduate students are expected to master the basic theories, knowledge, and skills of separation techniques involved in chemical processes. Furthermore, they will gain insights into the latest developments in separation engineering both domestically and internationally. The course aims to cultivate students’ abilities to identify, analyze, and solve problems, broaden their horizons, and foster innovative thinking, thereby cultivating them to become advanced professionals in research and development, process design and innovation, as well as engineering design.

Currently, there are several issues with similar textbooks and graduate education in this field both domestically and internationally: (1) The traditional approach to education in this field, which emphasizes conceptual definitions, theoretical systems, and teacher-centered instruction, while neglecting practical work, methodological strategies, and student engagement, has shown some drawbacks and deficiencies as time passes. This approach often leads to a disconnect between theoretical knowledge and practical application, limiting students’ abilities to innovate and solve real-world problems.

In contrast, case-based textbooks and teaching methods focus on practical applications and interactions between teachers and students. By presenting real-world scenarios and encouraging active participation and discussion, these methods can fully stimulate the innovative capabilities of both teachers and

students. They provide an effective way to cultivate high-quality, innovative, and practical talents in chemical engineering.(2)The course “Modern Separation Techniques” is designed to cover the latest process design concepts, novel separation principles, and the most advanced separation processes currently available both domestically and internationally. It is particularly focused on expanding knowledge and cultivating innovative thinking among graduate students, making it a highly enlightening and specialized course. During their graduate studies, students are expected to build on their existing professional knowledge to solve existing problems in known topics and develop innovative exploration skills in unknown areas. Therefore, in terms of textbook design, graduate students prefer that instructors impart the most advanced concepts and scientific problem-solving methods to assist them in their research endeavors.

However, the current textbooks on “Modern Separation Techniques” largely lag behind, focusing on the principles and process designs of relatively newer technologies from several years or even decades ago. The course content itself does not fully align with the concept of being “completely new.” As a result, graduate students often find the lectures dull and uninspiring. While receiving knowledge and information, they struggle to sensitively connect it to their current research topics.

To address this issue, it is crucial for textbooks and course materials on “Modern Separation Techniques” to be updated regularly to incorporate the latest advancements in the field. This will ensure that the course content remains relevant and engaging for graduate students. Additionally, instructors can supplement the textbook material with recent research articles, case studies, and industrial examples to provide a more comprehensive and practical understanding of the separation techniques.

Furthermore, instructors should encourage active participation and discussion in the classroom, fostering an environment where students can share their ideas, ask questions, and explore innovative solutions to real-world problems. By doing so, students can better connect the theoretical knowledge they are learning to their own research projects and develop a deeper understanding of the separation techniques covered in the course.

In order to establish world-class graduate education with Chinese characteristics, further implement the spirit of documents such as the “Healthy China 2030” planning outline and “Made in China 2025,” implement the strategy of strengthening the country through human resources, guide students to pursue genuine knowledge, hone real skills, and cultivate high-quality, innovative talents, and to meet the needs of graduate education and talent cultivation in the new situation, we aim to develop a curriculum system for domestic first-class graduate education. With this goal in mind, we plan to update the knowledge system around the teaching objectives of the course, incorporating cutting-edge research, the latest research findings, and practical experience into teaching. To this end, we propose to compile a case-study-based textbook titled “Modern Separation Techniques (Case Edition)” by adopting a compilation mode that combines case studies with teaching content. This approach will further strengthen the integration of science, education, and industry. The textbook will focus on practical applications and interactions between teachers and students, presenting real-world scenarios and encouraging active participation and discussion. By doing so, we aim to fully stimulate the innovative capabilities of both teachers and students and provide an effective way to cultivate high-quality, innovative, and practical talents in the field of separation techniques.

2. THE MAIN IDEAS FOR DEVELOPING THE TEXTBOOK “MODERN SEPARATION TECHNIQUES (CASE EDITION)” ARE AS FOLLOWS:

1) Integrating Cutting-Edge Research and Practical Applications:

Incorporate the latest research findings and practical experiences into the textbook content.

Emphasize the application of theoretical knowledge to real-world problems.

2) Case-Based Learning:

Develop a series of case studies that reflect typical applications of separation techniques in various industries. Use these cases to illustrate the principles, methodologies, and practical applications of separation techniques.

3) Interdisciplinary Approach:

Integrate knowledge from related disciplines such as chemistry, engineering, biology, and environmental science. Provide a comprehensive understanding of separation techniques across different fields.

4) Active Learning and Engagement:

Design exercises and projects that encourage students to actively engage with the material.

Use discussion, debate, and problem-solving activities to promote critical thinking and creativity.

5) Student-Centered Learning:

Focus on the needs and interests of students, tailoring the content to be relevant and engaging.

Incorporate feedback from students and instructors to continuously improve the textbook.

6) Strong Focus on Practical Skills:

Include detailed descriptions of laboratory techniques and experimental protocols.

Provide guidance on how to use separation techniques in research and industrial settings.

7) Support for Digital Learning:

Develop digital resources such as interactive simulations, videos, and online quizzes to complement the textbook. Utilize these resources to enhance student learning and provide flexible options for self-study.

8) Continuous Evaluation and Updating:

Establish a mechanism for continuous evaluation of the textbook's effectiveness. Regularly update the content to reflect new developments in the field of separation techniques.

By following these main ideas, the textbook “Modern Separation Techniques (Case Edition)” aims to provide a comprehensive, engaging, and practical learning experience for graduate students in the field of separation techniques. It will help students develop a deep understanding of the principles and applications of separation techniques, as well as the skills necessary to solve real-world problems in industry and research.

3. UNIQUENESS AND INNOVATION

Compared with similar teaching books both domestically and internationally, the characteristics are as followings.

1) Distinctive professional features and reasonable textbook system: this textbook is specifically designed for use in graduate-level teaching of chemical engineering. It emphasizes the engineering and technical requirements with a chemical engineering focus, adhering to the principles of “refining basic theories, optimizing specialized knowledge, strengthening practical abilities, deepening quality education, and highlighting professional characteristics” to construct a reasonable textbook system. With its distinctive professional features, it aims to serve the goal of new engineering education construction.

2) Based on educational objectives and catering to teaching needs: the compilation of this textbook closely revolves around the training objectives of the Chemical Engineering

program. Its content structure not only distinguishes itself from textbooks for related chemical engineering majors but also fully considers the societal demands for the knowledge, abilities, and qualities of professionals in this field. It ensures that students grasp fundamental theories, basic knowledge, and essential skills, thereby meeting the basic requirements for graduate teaching and nurturing advanced professionals capable of adapting to the standardized, large-scale, and modernized chemical industry.

- 3) Deepening Ideological and Political Education, Strengthening Ideals and Beliefs: Guided by Xi Jinping's Thought on Socialism with Chinese Characteristics for a New Era, the textbook places "cultivating talent with virtue" in a prominent position, so that the educational ideas and concepts, as well as the goals and content of talent cultivation embodied in the textbook, serve the cause of socialism with Chinese characteristics. Drawing on its own characteristics, the textbook integrates ideological and political education to inspire students' patriotic sentiments and foster a scientific spirit of daring to innovate and strive for excellence.
- 4) Combining Theory with Practice, Emphasizing the Integration of Science and Engineering: The textbook follows the overall requirements for textbook development of "three basics, five characteristics, and three specificities." It emphasized the integration of theory and practice, enabling students to combine their knowledge acquisition with future professional practice. It focuses on the integration of science and engineering, guiding students to use theory to guide engineering technology.
- 5) Optimizing the Compilation Format and Enhancing Case Introduction: The textbook adopts "practicality" as its starting and ending point in compilation, emphasizing the compilation approach of "case-based teaching" to organically integrate theoretical knowledge with job practice. This helps students understand the relationship between their learned knowledge and industries, achieving the purpose of applying knowledge in practice.
- 8) Comply with "Internet + Education", Promote the Integration of Print and Digital Media: While compiling the content of print textbooks, diversified digital teaching resources are concurrently developed. By incorporating two-dimension code in print textbooks, these resources seamlessly link to rich media content such as videos, animations, images, PPTs, audios, and documents. This integrates "online" and "offline" teaching seamlessly to meet students' personalized and autonomous learning needs.

4. CONCLUSION

The new textbook on Modern Separation Techniques can provide theoretical guidance for the development goals and directions of graduate education, fostering high-level specialized talents who possess strong abilities to solve practical problems, can undertake corresponding professional technical or management

work, and exhibit excellent professional ethics in society.

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